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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,529	05/12/2004	Michael J. Nowlan	101430-0185	3528

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NUTTER MCCLENNEN & FISH LLP
WORLD TRADE CENTER WEST
155 SEAPORT BOULEVARD
BOSTON, MA 02210-2604

EXAMINER
TRINH, THANH TRUC

ART UNIT	PAPER NUMBER
1753	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/709,529	NOWLAN ET AL.	
	Examiner	Art Unit	
	Thanh-Truc Trinh	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/29/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-5, 7, 9, 11-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Gross et al. ("Thermosensoric Localization of Defects in CIS Solar Modules", 26th PVSC, Sept. 30-Oct. 3, 1997, Anaheim CA).

Regarding claim 1, Gross et al. disclose a system for inspecting solar cell arrays, comprising solar cell array; a test module for inspecting the array, wherein the inspection module comprising an electrical source (DC source) adapted for electrically coupling to the solar cell array so as to generate a forward-bias current through the array in order to cause its heating, and an infrared camera directed at the heated cell to generate thermal images of at least a portion of the array. (See section titled "Experimental"). Gross et al. describe the inspection operating on a solar cell array (of 5 and 9 cells in the section titled "Experiment"), therefore it is inherent that the solar cell array is assembled before the inspection in a module for assembling a solar cell array.

Gross et al. teach the limitation of the instant claim, thus the reference is deemed to be anticipatory.

Regarding claim 2, Gross et al. disclose an image analysis module (infrared camera) receiving the thermal image, and inspecting the image so as to identify defects in the solar cell array. (See section titled "Experimental")

Regarding claim 3, Gross et al. describe the defects associated with material defects, electrical shunts on individual cells and on connection stripes. (See section titled "Introduction"). In other words, the defects can be microcracks, defective of solder joint (or connection stripes).

Regarding claim 4, Gross et al. disclose the defects occur at interconnections among cells forming the array, or connection stripes. (See section titled "Introduction")

Regarding claim 5, Gross et al. describe the defects in connection stripes. (See 2nd paragraph of section titled "Introduction"). In other words, the defects comprise any of defective solder, weld or adhesive bonds between any two of the cells in the array.

Regarding claim 7, Gross et al. disclose the image analysis module employs an intensity variance technique to identify defects in the thermal image. (See Figures 1-2 and 4)

Regarding claim 9, Gross et al. disclose the solar cell array comprises a plurality of solar cells each formed of $CuInSe_2$ (CIS), a polycrystalline semiconductor material. (See section titled "Introduction").

Regarding claim 11, Gross et al. disclose a method for detecting defects in a solar cell, comprising generating a forward-bias current through the cell to cause its

heating, and inspecting a thermal image of the heated cell to identify defects therein. (See sections titled "Introduction", "Experimental" and "Results and Discussion").

Regarding claim 12, Gross et al. describe obtaining a thermal image of the heated cell in the infrared region of the electromagnetic spectrum. (See section titled "Experimental")

Regarding claim 13, Gross et al. describe the inspecting step comprises identifying defects that disrupt a normal flow of the current through the cell. (See sections titled "Introduction", "Experimental" and "Results and Discussion")

Regarding claim 14, Gross et al. describe the defects can be material defects, electrical shunts, etc... in the individual cells and on the connection stripes of solar modules. In other words, the defects can comprise any of microcracks or missing solder joints.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

2. Claims 6, 10 and 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gross et al. ("Thermosensoric Localization of Defects in CIS Solar Modules", 26th PVSC, Sept. 30-Oct. 3, 1997, Anaheim CA) in view of Nowlan et al. ("Automated Solar Cell Assembly Teamed Process Research", National Renewable Energy Laboratory (NREL) (Feb. 1996).

Gross et al. disclose a system and method for inspecting solar cell arrays as described in claims 1 and 11.

Gross et al. do not teach employing an edge detection technique to identify defects in the thermal image, comparing the image to a reference. Nor do they teach using an automated conveyance element for transporting array components to the inspection module prior to finishing the array.

With respect to claims 6 and 16, Nowlan et al. teach employing an edge detection. (See section "2.2.3.4 Vision System Software Evaluation)

With respect to claims 10 and 17, Nowlan et al. teach using an automated conveyance element for transporting array components to the inspection module prior to finishing the array. (See section 1 – Introduction)

With respect to claim 15, Nowlan et al. teach comparing the image to a reference. (See section "2.2.3.4 Vision System Software Evaluation)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system and method of Gross et al. by employing edge detection technique, comparing image to a reference and using automated conveyance element as taught by Nowlan et al., because it would achieve high yield and increase efficiency. (See "Section 2 – Techinical Discussion")

3. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gross et al. ("Thermosensoric Localization of Defects in CIS Solar Modules", 26th PVSC, Sept. 30-Oct. 3, 1997, Anaheim CA) in view of Breitenstein et al. ("Imaging the local forward current density of solar cells by dynamical precision contact thermography", 1st WCPEC; Dec. 5-9, 1994; Hawaii)

Gross et al. disclose a system for inspecting solar cell arrays as described in claim and 1.

Gross et al. do not specifically teach the current density of the forward bias ranging from 70 mA/cm^2 to 200 mA/cm^2.

Breitenstein et al. teach the current density of the forward bias can be increased to show the shunt up stronger. (See page 1635, col. 2 first paragraph)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system and method of Gross et al. by applying a high forward bias current density and up about 70mA/cm^2 to 200mA/cm^2 as taught by Breitensten et al., because it would show the shunts stronger. (See page 1635, col. 2 first paragraph)

4. Claims 18 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gross et al. ("Thermosensoric Localization of Defects in CIS Solar Modules", 26th PVSC, Sept. 30-Oct. 3, 1997, Anaheim CA) in view of King et al. ("Applications for infrared imaging equipment in photovoltaic cell, module, and system testing" Photovoltaic Specialists Conference, Sept. 15-22, 2000, pages 1487-1490, Anchorage AK)

Regarding claims 18 and 19, Gross et al. disclose a method for inspecting solar cell arrays as described in claim and 1.

Gross et al. do not specifically teach the inspection step occurs prior to encapsulation or finishing the array.

King et al. teach the inspection step can be done to the cell material directly. (See page 1488, 2nd column)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method of Gross et al. by applying the inspection

directly to the cell, or before the encapsulation or finishing the array, as taught by King et al., because it would provide shape peak of temperature. (See page 1488, 2nd column).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TT

7/22/07

KAJ K. OLSEN
PRIMARY EXAMINER